

# Ecological site R057XY007MN

## Steep Upland Prairie

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### General information

**Provisional.** A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

### MLRA notes

Major Land Resource Area (MLRA): 057X–Northern Minnesota Gray Drift

The Northern Minnesota Gray Drift (57) is located within the Northern Lakes Forest and Forage Region. This area is entirely in north-central Minnesota and makes up about 9,785 square miles (Figure 1). The entire area is covered by Wisconsin-age glacial drift. The glacial deposits are from four major ice lobes-Des Moines, Rainy, Superior, and Wadena. The landscape developed through a series of glaciations and the subsequent retreating and wasting of the ice sheets, which resulted in a complex pattern of moraines, outwash plains, drumlins, lake plains and drainages. Lakes, ponds and marshes are common. The thickness of the glacial till ranges from 90 to 185 meters. Some areas of these deposits are overlain by outwash or lacustrine sediments. Some depressional areas have an accumulation of organic matter. The organic deposits are more than 2.5 meters thick in some areas. Elevation ranges from 300 to 500 meters across the area. (USDA-NRCS 2006) The dominant soil orders in this MLRA are Alfisols, Entisols, and Histisols, with some Mollisols in the westernmost part of the area. The soils in the area have a frigid soil temperature regime; aquic or udic soil moisture regime, and mixed mineralogy. Their natural drainage class is related to landscape position. In general, the Alfisols formed in till on moraines, Entisols formed in outwash on moraines and outwash plains, and Histisols formed in organic material over outwash or till on moraines or outwash plains. (USDA-NRCS 2006)

### Classification relationships

Major Land Resource Area (MLRA): Northern Minnesota Gray Drift (57) (USDA Handbook 296, 2006) USFS Subregions: Northern Minnesota Drift & Lake Plain Section (212N); Chippewa Plains Subsection (212Na), Pine Moraines & Outwash Plains Subsections (212Nc), St. Louis Moraines Subsection (212Nb); Minnesota & NE Iowa Morainal Section (222M); Hardwood Hills Subsection (222Ma); Northern Superior Uplands Section (212L); Nashwauk Uplands Subsection (212Lc); Northern Minnesota & Ontario Peatlands Section (212M); Littlefork-Vermillion Uplands Subsection (212Ma) (Cleland et al. 2007). US EPA Level IV Ecoregion: Itasca and St. Louis Moraines (50q); Chippewa Plains (50r); Nashwauk/Marcell Moraines and Uplands (50s); Alexandria Moraines and Detroit Lakes Outwash Plain (51j); McGrath Till Plain and Drumlins (51k); Wadena/Todd Drumlins and Osakis Till Plain (51l)(U.S. Environmental Protection Agency, 2013)

### Ecological site concept

Steep Upland Prairie sites are limited in extent in the southern region of MLRA 57, and typically occur on moraines and with slope gradients greater than 12 percent. Soils textures can vary from medium to fine textured and are mollisols with dark organic-enriched upper horizons. Plant communities are graminoid dominated.

### Associated sites

|             |                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R057XY010MN | <p><b>Loamy Prairie</b></p> <p>These sites occur on summit, shoulder and upper backslope hillslope positions on moraines and outwash plains. These sites typically exist on soils with loamy and clayey textures of loam, silt loam, silty clay loam, clay loam, sandy clay loam, very fine sandy loam, clay, silty clay and silty clay loam within a depth of 50 centimeters.</p> |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Table 1. Dominant plant species

|            |                                                                     |
|------------|---------------------------------------------------------------------|
| Tree       | Not specified                                                       |
| Shrub      | Not specified                                                       |
| Herbaceous | (1) <i>Andropogon gerardii</i><br>(2) <i>Bouteloua curtipendula</i> |

### Physiographic features

Steep Upland Prairie sites are limited in extent in the southern region of MLRA 57, and typically occur on moraines and with slope gradients greater than 12 percent.

**Table 2. Representative physiographic features**

|                    |                                      |
|--------------------|--------------------------------------|
| Hillslope profile  | (1) Backslope<br>(2) Shoulder        |
| Landforms          | (1) Outwash plain<br>(2) Delta plain |
| Runoff class       | Negligible to very low               |
| Flooding frequency | None                                 |
| Ponding frequency  | None                                 |
| Elevation          | 230 – 310 m                          |
| Slope              | 10 – 30 %                            |
| Aspect             | Aspect is not a significant factor   |

### Climatic features

In general, MLRA 57 has cold winters and warm summers. About 65 percent of the annual precipitation falls as rain during the 5-month growing season (May through September), and an additional 18 percent falls as snow. The freeze-free period averages 150 days and ranges from 120 to 175 days.

**Table 3 Representative climatic features**

|                                           |              |
|-------------------------------------------|--------------|
| Frost-free period (characteristic range)  | 100-110 days |
| Freeze-free period (characteristic range) | 130-140 days |

|                                            |              |
|--------------------------------------------|--------------|
| Precipitation total (characteristic range) | 690-740 mm   |
| Frost-free period (actual range)           | 100-110 days |
| Freeze-free period (actual range)          | 130-140 days |
| Precipitation total (actual range)         | 660-760 mm   |
| Frost-free period (average)                | 110 days     |
| Freeze-free period (average)               | 130 days     |
| Precipitation total (average)              | 710 mm       |

- (1) LONG PRAIRIE [USC00214861], Long Prairie, MN
- (2) ITASCA UNIV OF MINN [USC00214106], Park Rapids, MN
- (3) NEW YORK MILLS [USC00215902], New York Mills, MN

### Influencing water features

Not Applicable.

### Wetland description

Not Applicable.

### Soil features

This site is represented by the Maddock soil series, although other series could be included as well. Soils textures can vary from medium to fine textured and are mollisols with dark organic-enriched upper horizons. These sites are typically well to somewhat excessively drained soils with depth to gray and or rust colored redoximorphic features or depth to seasonal high water-table ranges from 75 to more than 150 centimeters.

**Table 4. Representative soil features**

|                    |                                                   |
|--------------------|---------------------------------------------------|
| Parent material    | (1) Glaciolacustrine deposits                     |
| Surface texture    | (1) Loam<br>(2) Sandy loam<br>(3) Loamy fine sand |
| Drainage class     | Well drained to somewhat excessively drained      |
| Permeability class | Moderately rapid to rapid                         |

|                                                         |               |
|---------------------------------------------------------|---------------|
| Depth to restrictive layer                              | 180 cm        |
| Soil depth                                              | 200 cm        |
| Surface fragment cover <=3"                             | 0 – 10 %      |
| Surface fragment cover >3"                              | Not specified |
| Available water capacity<br>(0-381cm)                   | 0 – 10.16 cm  |
| Calcium carbonate equivalent<br>(0-254cm)               | 0 – 10 %      |
| Soil reaction (1:1 water)<br>(0-254cm)                  | 6.6 – 8.4     |
| Subsurface fragment volume <=3"<br>(0-101.6cm)          | 0 – 10 %      |
| Subsurface fragment volume >3"<br>(Depth not specified) | Not specified |

## Ecological dynamics

Plant communities typical with Steep Upland Prairies tend to be graminoid-dominated herbaceous communities of little bluestem, side-oats grama, plains muhly, and prairie dropseed. The low shrub wolfberry is commonly found along with leadplant, prairie rose and sage wormwood shrubs. Forbs important to this site are heart-leaved alexanders, alumroot, northern bedstraw, white aster-like goldenrod, prairie phlox to mention a few.

## State and transition model

### Additional community tables

Table 5. Community 1.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 6. Community 1.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 7. Community 2.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 8. Community 2.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 9. Community 2.3 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 10. Community 3.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 11. Community 4.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 12. Community 4.2 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

## Inventory data references

Information presented was derived from Minnesota Department of Natural Resources Field Guide to the Native Plant Communities of Minnesota, USDA-NRCS soil survey information, and USDA Plants Database. Relationship to Other Established Classifications: MN DNR Native Plant Community (MN DNR, 2003); the reference community of this Provisional Ecological Site is most similar to: UPs13d Southern Dry Prairie (Dry Hill Prairie-southern)

## Other references

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U.S. Environmental Protection Agency. 2013. Level III and IV ecoregions of the continental United States: Corvallis, Oregon, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000, <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>.

## Contributors

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## Approval

Suzanne Mayne-Kinney, 10/03/2023

## Acknowledgments

## Rangeland health reference sheet

**Interpreting Indicators of Rangeland Health** is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

|                                             |                   |
|---------------------------------------------|-------------------|
| Author(s)/participant(s)                    |                   |
| Contact for lead author                     |                   |
| Date                                        | 09/14/2026        |
| Approved by                                 |                   |
| Approval date                               |                   |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

**1. Number and extent of rills:**

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**2. Presence of water flow patterns:**

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**3. Number and height of erosional pedestals or terracettes:**

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**4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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**5. Number of gullies and erosion associated with gullies:**

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**6. Extent of wind scoured, blowouts and/or depositional areas:**

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**7. Amount of litter movement (describe size and distance expected to travel):**

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8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

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9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

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10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

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11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

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12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

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13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

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14. Average percent litter cover (%) and depth ( in):

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15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):

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16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

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17. Perennial plant reproductive capability:

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